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Regarding "Description of a risk predictive model of 30-day postoperative mortality after elective abdominal aortic aneurysm repair"

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The report by Eslami et al. describes their development of a risk prediction model for elective abdominal aortic aneurysm (AAA) repair from the American College of Surgeons National Surgical Improvement Project (NSQIP) database[1]. The authors should be commended on this, the first general peri-operative risk model for AAA to incorporate frailty, increasingly recognised as a predictor of outcome in vascular patients, particularly following AAA repair[2-4].

Their report follows a multitude of papers describing risk-prediction tools for AAA repair, some of which are mentioned in their report. Strangely lacking, however, is a comparison with the performance of these models, many of which report better discrimination on both internal[5] and external validation[6]. Also lacking is a comparison with the AAA-SCORE[7], a risk prediction tool developed from the UK National Vascular Database and published by our group in this journal in 2015, which has since been shown to perform well on external data, despite the fact that one of the terms was imputed to a single value[6].

A further deficiency is evident in the handling of missing data. The authors acknowledge the presence of missing data in their database, but fail to describe the degree of missingness. In addition, it has been shown[6] that missing items in surgical registries are rarely 'missing completely at random', as they are more likely to be missing if outcomes are poor. In this context, it would be far more appropriate to apply modelling techniques such as multiple imputation (as we did when developing the AAA-SCORE), as these techniques are robust to the presence of data whose missingness is related to other measured covariates, such as outcomes, so has been recommended by prominent expert reviews[8].

The proof of any risk predictor is external validity: the ability to predict outcomes outwith the dataset from which it was generated. Unfortunately, demonstrating this

for the NSQIP model may be difficult, as it contains unique features such as a history of weight loss and functional independence, which are infrequently measured in surgical registries. We tested the NSQIP model with these features removed (in addition to history of COPD or PVD which also were not recorded) on the elective UK data used to generate AAA-SCORE. The resulting c-statistic for this unfair comparison was only 0.55 (compared to 0.82 for AAA-SCORE). It would be interesting to know how much better the model would perform had these factors been recorded.

Finally, the authors develop a scoring system to simplify calculation, emphasising the benefits of dichotomising data for this purpose. Given the widespread adoption of smartphones, we question the utility of this procedure, as the majority of practitioners are surely going to rely on either a web-based calculator or a smartphone app (both of which are available for AAA-SCORE[9]).

In conclusion, the authors have developed a unique model incorporating key aspects of frailty into pre-operative assessment of the patient with an AAA. However the lack of robust statistical methodology and the absence of external validity implies that it is not ready for adoption into clinical practice.

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